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ABSTRACT

Due to an increased awareness of the need for accountability in vocational education, much attention is being focused upon competency-based vocational education. The U.S. Office of Education is supporting work for the development of competency measures for vocational skill areas. Two occupational competency tests in each of seven areas will be developed, reviewed, field tested, and validated to ensure their effectiveness. These tests are available to all states that wish to utilize them. Many features of competency-based testing procedures offer advantages over other methods. These advantages include being free from sex bias and race bias. The identification of competency requirements for occupational areas is a process which requires a great deal of care. Competency-based vocational education will be an increasingly important component in educational programs. The Bureau of Occupational and Adult Education supports and encourages its use. (Author)

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COMPETENCY BASED VOCATIONAL EDUCATION

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The competency based testing movement has brought this basic concern into public view. The passage of the 1976 amendments to the Vocational Education Act gave additional visibility to the problem of the evaluation of vocational education. Among the expanded evaluation requirements in these amendments are annual state accountability reports, follow-up studies by the 57 States and outlying areas using criteria of employment in training-related occupations, and employer appraisals of the extent to which students are well-trained and prepared for employment. Additionally, States are required to conduct an evaluation of individual vocational education programs across the State over a five year period.

The introduction of competency based testing in vocational education programs, where the subject matter may be more clearly defined than in general education programs, can allow greater guarantees of the effectiveness of the teaching and of the students' learning.

Also, competency based vocational education can be used to ensure that vocational education programs are evaluated adequately. Competency based testing of the completers of vocational education programs serves to provide evidence that the graduates have knowledge of, and can perform successfully in, a selected occupational area.

Programs which certify their graduates by examination are common to many of the professions. As more and more occupational areas, such as cosmetology, barbers, electricians and others are having state boards of certification and liscensure established, it is only natural to expect that there would be a corresponding increase in the use of qualifying examinations for program completers in vocational areas.

It appears that the continued development of basic competency measures would answer a serious need in the field of vocational education. It is not only the taxpayers, teachers, and students who want and need to know how effective vocational education is but others as well. Representatives of industry, labor, the military, and State departments of education have voiced an interest in tests that would accurately reveal the types, nature, and extent of job-related competencies acquired by vocational education students.

ABSTRACT

Due to an increased awareness of the need for accountability in vocational education much attention is being focused upon competency based vocational education. The U.S. Office of Education is supporting work for the development of competency measures for vocational skill areas. Two occupational competency tests in each of seven areas will be developed, reviewed, field tested, and validated to ensure their effectiveness. These tests are available to all States that wish to utilize them. Many features of competency based testing procedures offer advantages over other methods. These advantages include being free from sex bias and race bias. The identification of competency requirements for occupational areas is a process which requires a great deal of care. Competency based vocational education will be an increasingly important component in educational programs. The Bureau of Occupational and Adult Education supports and encourages its use.

INTRODUCTION

The United States Office of Education has the responsibility for administering educational programs and implementing educational policy as legislated by the Congress. Within the Office of Education, the Bureau of Occupational and Adult Education administers those programs that deal with vocational and adult education. The Division of Research and Demonstration administers the national discretionary programs in vocational education.

As representatives of the Division of Research and Demonstration, we welcome the opportunity to present to this group information about our work, our ideas, and our goals in regard to competency based vocational education.

More specifically, we will provide information about work which is being supported in the area of competency based vocational education and applications for competency based vocational education.

CALL FOR ACCOUNTABILITY

There has been an increased measure of importance attached to competency based education. This is due, in part, to the current demand for accountability in education. Public acceptance of expenditures for education is becoming more contingent upon the school's "track record". In brief, good education will be supported, ineffectual education programs will not be supported. Recently many questions such as the following have been asked about vocational education: Is the expenditure of public funds justified? Are there employment opportunities for the graduates of vocational training programs? Is vocational education effective? (1)

Up to this time, due to the lack of other measurable criteria, the major criterion concerning the effectiveness of vocational education has been the placement rate for graduates. While the placement rate of graduates is reflective of a great many things; regional and local employment conditions, general economic activity, or the willingness or unwillingness of local employers to accept a diploma as proof of a job skill, it does not in any consistent manner attest to the effectiveness of the teaching that the students have experienced or the skills they have learned. Teachers, as well as employers, need something to measure their effectiveness. How can a teacher determine if a student has made adequate progress? Without some objective guide, a teacher has no choice but to subjectively compare the student's behaviorial patterns with pre-stated objectives and must rely upon his/her own judgement. The essential question is: To what degree are these judgements valid?

U.S. OFFICE OF EDUCATION SUPPORTED PROJECTS

American Institutes for Research

The Office of Education has recently awarded a three year contract for the development of competency measures for vocational skill areas. The contractor will develop and validate tests that will allow the measurement of competencies acquired by students in selected vocational education programs.

This project also reflects the importance that the National Association of State Directors of Vocational Education attaches to this area. They requested, in response to a call for comments published in the Federal Register, that the Office of Education issue a Request for Proposal for the support of a project to develop competency tests. Each year the Bureau of Occupational and Adult Education publishes in the Federal Register its proposed activities and priorities for the coming year. The Bureau asks for suggestions and comments from the interested public in response to this announcement.

The American Institutes for Research, the contractor selected by the Office of Education, will develop selected occupational student competency tests for use in vocational education programs. Two tests will be developed in each of the following seven program areas: (1) trade and industry, (2) home economics, (3) health, (4) distributive education, (5) technical, (6) business and office, and (7) agriculture. These tests will include evaluation methodologies for measuring students' performance on selected tasks. Also, methodologies for measuring the students' cognitive skills will be included in order to measure their knowledge and understanding of the subject. The students' affective outlook, their attitudes and motivation towards the occupational area, will also be able to be evaluated. These tests will be thoroughly reviewed, pilot tested on a small scale, revised if necessary, nationally field tested, and validated to ensure their effectiveness. Field testing and validation will include data obtained both from students in school and employees in industry.

Following completion of the developmental work, a national workshop will be held to give a full briefing on the tests to State education agency and postsecondary personnel in all states and outlying areas. Project staff will also provide technical assistance to selected States if the States choose to implement the tests in their regular school programs. Project staff will also develop and help to implement a plan for the continued development of occupational competency testing on a self-supporting basis after the three year contract is completed.

It is important to bear in mind that although these tests will be developed with support from the Federal Government, these tests will not, in any way, be Federal tests. This will not be a Federal testing program. The tests will be made available to States and educational institutions which can then use them if they wish. No one is required to use these tests. However, we believe that these tests will be of high enough quality that States, local education agencies, individual schools and educational organizations will want to use them.

Competency based testing is not new to the field of vocational education. Vocational educators have used competency based testing successfully for many years. An outstanding example of this is in the area of business education where typing and shorthand tests and tests involving office equipment have been used for a considerable period of time.

The National Center for Research in Vocational Education

Other efforts to develop performance based competency materials have received Federal support. The National Center for Research in Vocational Education at the Ohio State University has developed Performance Based Teacher Education Materials. Performance based teacher education is an approach to teacher preparation in which the teacher is required to demonstrate essential teaching tasks in an actual teaching situation. Actual performance of the tasks helps to ensure that the teacher has not only the knowledge required, but also the ability to perform the skills that are essential to successful teaching. Performance based teacher education is a promising alternative to the more traditional preservice and inservice methods of educating teachers.

One hundred modules in ten teacher education professional skill categories have been produced and the response from the vocational educational field has been overwhelming. All 50 States, all Canadian provinces, 15 foreign countries, 5 departments of the United States Government, over 400 colleges, and 200 local education agencies, as well as private corporations such as Kodak, 3-M and IBM have purchased these instructional materials. The Office of Education is currently supporting efforts by the National Center to develop additional modules to adequately prepare teachers for working with special needs populations.

National Occupational Competency Testing Institute

Another organization which is very involved with vocational education competency testing is the National Occupational Competency Testing Institute (NOCTI). This organization develops performance based examinations which are based upon task analyses of selected jobs. These task analyses are used for the development of tests for the assessment of skill competencies of teachers for certification purposes by the States as well as for the development of student competency examinations. The group that became The National Occupational Competency Testing Institute was originally funded by a grant from the Office of Education and has since evolved into a very effective organization working with 47 States. This Institute engineers highly reliable instruments which can be used to assess the quality of teachers, students, and/or programs.

FEATURES OF COMPETENCY BASED VOCATIONAL EDUCATION

There are major advantages to be gained from the use of competency based testing procedures. These advantages include allowing the direct measurement of job skills which cannot be inferred from written tests alone, and they can provide a high level of realism both in the tasks performed and in the surrounding conditions.

Of importance to the long standing but newly emphasized requirements of equity, the verbal demands on the examinee made by sample job tests can more often match the actual job requirements than can paper and pencil tests. This procedure significantly reduces the test bias against those students with low verbal skills. Furthermore, competency based testing is, by its very nature, largely free from both sex bias and race bias. In such testing procedures, competencies override biases.

Ideally, competency based vocational education programs should encompass the following features: (2)

1. Pre-testing students upon entry to determine the skills they already have as well as determining the competencies that need to be achieved.

2. Allowing each student to proceed to subsequent instruction as soon as competencies are attained.

3. Providing an alternative method of instruction if a student does not achieve a competency.

4. Recording student performance as each competency is achieved.

5. Placing greater emphasis on exit requirements (competencies to be achieved) than on entrance requirements.

6. Assessing students on the basis of competencies.

Obviously it is this last step, assessing students on the basis of competencies that we are most concerned with in our discussion. The effectiveness of competency based vocational education is largely dependent upon the development and appropriate use of valid competency measures. These measures are needed for certifying student proficiency and for diagnosing students' needs; but they are also of importance for satisfying any evaluation requirements that have to be met.

DEVELOPMENT OF COMPETENCY TESTS

The difficulties of constructing, administering, and scoring competency tests are well known. Usually these tests are based upon either job analysis to determine which skills and abilities are of chief importance in the job or they are based upon a family of behavioral objectives. The process of selecting the tasks the students must perform and the conditions under which they should be performed is the single most difficult part of competency based vocational education. Evaluation criteria must be developed so that a teacher is able to systematically score a student's performance.

Although a prospective bricklayer can be asked to lay a wall of bricks in a straight line and thus, provide an indicator of how successful he(she) may meet one job entry skill required for the field of bricklaying, there are other occupational areas in which the selection of test criteria is not so easy. How, for instance, do you develop suitable performance exercises for determining job entry skills for an area such as firefighting?

The identification of competency requirements for occupational areas is a process which requires a great deal of care and raises many questions. Among the major concerns are the following: (3)

1. Frequency - What proportion of the workers in the occupation actually perform the task? How often is the task performed?

2. Importance - Does the task represent a critical aspect of the job? Are other tasks dependent upon it?

3. Difficulty - Is the task performed by entry level workers? Or does it require advanced practical knowledge?

4. Complexity - Does the task subsume a number of simpler task elements?

5. Expectations - Do employers assume the competency to be learned in a school or is it learned on the job?

6. Job Success - Is there evidence (or consensus among employers) that persons having particular competencies are more likely to be successful on the job?

7. Testing Domain - Does the task fall primarily in the affective, cognitive, or psychomotor domain?

8. Administration of Testing - Can performance of the task be adequately assessed in schools, given the requirements of time, equipment and safety?

9. Generality - Is the task performable by anyone or are certain categories of people at a disadvantage?

10. Availability of Tests - Are there validated, nationally used tests?

11. Certification Requirements - Are there business, governmental, or union certification or requirements involved?

This list of concerns makes it clear that a thoughtful and careful analysis of the tasks in each occupation is essential if competency based tests are to be a useful method of measuring a student's performance. The fourteen occupational competency tests to be developed by the American Institutes for Research will be constructed in accordance with the concerns listed above.

Suppose that a woodworking vocation has been selected and the critical tasks which should be tested involve, as a task element, the use of a circular saw to cut boards and the accurate measurement of the width of the cut. The question could arise as to whether this task/item would inherently prevent a visually handicapped person from demonstrating competence. The answer is that it may not exclude a visually handicapped person who had access to appropriate adaptive equipment. In this example, the measuring aspect could be handled either through the use of a specially marked metal rule, a special "click-rule" (available from the American Foundation for the Blind), or through a shop-made gauge block. (4)

During the task analysis, if it appears that a certain task, unavoidably, presents systematic difficulties for certain populations, this will be noted and possible exception rules or adaptations will be suggested by the American Institutes for Research.

A question that is often raised is should the scoring of performance tests be based on process or on product? In general, when a physical product is the goal of the work and if standards of quality are available, i.e., accuracy, meeting specified tolerances, etc. the test should be designed to provide information about the product. A simple illustration of product evaluation drawn from woodworking would be the evaluation of a board which has been cut and finished in conformance with a set of directions. A more complex example would be the evaluation of a cabinet or bureau made from plans. The evaluation, in this case, would be based upon its conforming to prescribed dimensions, the tightness of the joints, its sturdiness and its finish.

In those cases where the end product is not a standard item, or where the result is a cooperative effort of several workers working together, or where adherence to safety precautions are critical, then competency tests should measure the adequacy of the process. (5)

One of the strengths of process evaluation is that it can be diagnostic of specific difficulties the student may have. Deficiencies such as misinformation, wrong choice of tools, and inadequate skill level are obvious if competency testing is used in an intermediate check on progress and use can be made of this information in helping the student. Of course, in some cases a combination of product and process evaluation is necessary.

THE FUTURE OF COMPETENCY BASED VOCATIONAL EDUCATION

Competency based education is a valuable tool. It is one of the many tools available to educators in general and to vocational educators in particular. Although there are many applications and numerous benefits to be gained from wider recognition of the efficacy of competency based vocational education programs, we must keep in mind that it is one of many tools. It is not a solution for everything. Even though we are putting considerable sums of money into competency test development, we would be among the first to admit that it is not a solution for all difficulties encountered in vocational education.

As our society advances we will hear increased demands for "proof" that our schools work. We will see the wide-spread use of modularized curriculum, in which learners progress at their own rate after demonstrating the successful completion of earlier modules. Students will demonstrate their mastery of the modules as they progress by showing themselves competent. Their performance on tests will indicate they have acquired the skills needed to advance.

As education moves toward open entry, open exit systems, we will no longer automatically promote learners every June at the end of the school year. Students will be able to start at any time and when they demonstrate competence in the skills of the subject matter, they will not have to continue in the class.

An awareness of the directions in which our schools and educational techniques are moving demand that we prepare for these changes. That is what the Office of Education is trying to do with its support for the development of competency based performance tests.

There are many positive aspects to competency based vocational education. In addition to the advantages mentioned earlier such as being free from both sex and race bias and providing a high level of realism for testing purposes, there are other benefits to be gained. These advantages include the fact that competency based vocational education has demonstrated over and over again that the students exposed to it meet their learning objectives.

Competency based testing allows observation of the skills that have been mastered by students as well as being useful for the diagnostic evaluation of students' performance. These tests are specific enough so that the results are more objective and reliable than other evaluation methods such as written achievement tests and subjective performance ratings.

Obviously all behaviors cannot be tested. Work samples and simulation tests do not equal the actual workplace. The assumption underlying the use of the work sample is that its close approximation of the circumstances and procedures of the real workplace present a truer measure of the students' competence at the appointed task. Work samples are also used to measure occupational competence in ways that paper and pencil tests cannot. For example, the presentation of a malfunctioning TV set to a student in a TV technician course measures those competencies that paper and pencil tests cannot. As mentioned earlier, student typists and stenography students work almost exclusively with work samples.

There are some problems with competency based testing that have to do with the actual test itself. The tests may require the use of scarce equipment, producing a logistics problem. They may require the use of equipment that is delicate and easily damaged and is expensive to repair or replace. Additionally, the use of some equipment may present hazards for the student, particularly if the student's competence cannot be demonstrated satisfactorily.

For every occupational area for which competency based vocational education is desirable, task analyses have to be conducted. Various behaviors have to be identified. Operational criteria must be selected. The possibility of the technological obsolescence of particular job fields must be considered.

Education has to be provided for vocational educators so that they may learn how competency based vocational education was developed and how they can use it if they desire. A large information dissemination program, of which this presentation is one small piece, is needed to increase awareness of these techniques.

We must not underestimate the difficulties of identifying appropriate scoring standards. A great deal of time and energy must be devoted to this area in order to arrive at valid tests and scoring systems. In the American Institutes for Research project, scoring standards for four discrete areas will be developed. Content related to such areas of job performance as (a) operations (skills involving the correct manipulation of tools and equipment to complete tasks using correct procedures), (b) related technical information (necessary to carry out the tasks), (c) trade theory (technical background knowledge associated with the tasks), and (d) general knowledge (safety considerations, etc.) will be included in these standards.

CONCLUSION

Our position within the Bureau of Occupational and Adult Education is, obviously, that we believe that competency based vocational education is a very valuable tool whose use should be more widespread than is at present. We encourage its development and our support of the American Institutes for Research project is the harbinger of expanded interest in this area. We anticipate continuing encouragement and support of competency based vocational education. We hope that the State Directors of Vocational Education and other influential decision-makers within the States will continue their support and interest in competency based vocational education.

Competency based vocational education is an effective tool and we support its spread. We are in favor of a systematic approach to testing which "uncovers" students' proficiencies and which improves accountability of vocational education programs. In summary, let us indicate that with the advent of competency based vocational education a need has been created for occupational competency measures well beyond those that are now available. The effects and benefits of vocational student competency testing are far-reaching. The results will be valuable in revealing to both teachers and students the progress that has been made in preparing students for specific jobs, as well as in certifying student competencies to prospective employers. Moreover, competency testing will have an increasing impact in the future on the area of program improvement. Such testing should yield results useful to vocational administrators, teachers, guidance and counseling personnel and others concerned with the further improvement of the teaching and learning process in vocational education.

REFERENCES

1. Philosophical, Practical, and Technical Issues Pertaining to Performance Testing in Vocational Education: A Position Paper - Henry Borow, University of Minnesota (Typewritten copy).

2. This list is from Russell, E.B. Examples of Competency-Based Vocational Education and where to find them. American Vocational Journal, May 1978, 53 (5), pp. 32-34.

3. This is adapted from material contained within Technical Proposal: Development of Competency Measures for Vocational Skill Areas. Submitted to U.S. Office of Education in response to RFP-79-46, American Institutes for Research, Palo Alto, California, July 20, 1979, pp. 65-67.

4. ibid., page 4.

5. This example is from Philosophical, Practical, and Technical Issues, p. 13.

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